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ABSTRACT

This paper presents a system for describing and categorizing various theories of language and thinking. Within this system, theories are described in terms of their position on three basic issues: (1) the direction of dependency between language and cognition, (2) the necessity of that dependency, and (3) the level of specificity at which the dependency is believed to operate. In addition, a theory may stipulate that these relationships are stable or varying over time. It is suggested that this descriptive system might be used to compare the positions of two theorists, to compare changes over time in a given theorist's stated position, or to determine the level of proof adequate for testing a given theoretical statement. (Author/BRT)

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THE RELATIONSHIP OF CHILDREN'S LANGUAGE AND COGNITIVE DEVELOPMENT: THEORETICAL ISSUES

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00002

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00003

The Relationship of Children's Language and Cognitive Development: Theoretical Issues

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A central question in human development is the relationship of children's language and thinking. There are some who consider that language and thinking are the same,[1] or that language and thought are independent.[2] From a viewpoint of either total overlap or total independence, it would make little sense to ask "What is the relationship of language and thinking?"

The great majority of theorists, however, start from the assumption that language and thinking are related in some meaningful way. From that point, theories diverge widely, resulting in a great array of theories which at first seem ill-assorted, almost an unclassifiable assemblage of miscellaneous parts. On careful study, however, certain patterns emerge. While theories differ in scope and in their specific position on certain issues, each almost inevitably addresses itself to a common set of basic issues, though each may additionally address other issues.

These issues, then, may provide an organizational principle on which to base a systematic examination of theories of the relationship of language and cognitive development. The most prominent issues appear to concern the direction of the dependency between language and thinking, the necessity of this dependency, and the level of specificity at which the dependency is believed to operate. These issues will be described as dimensions which, taken jointly, form a three-dimensional descriptive system.

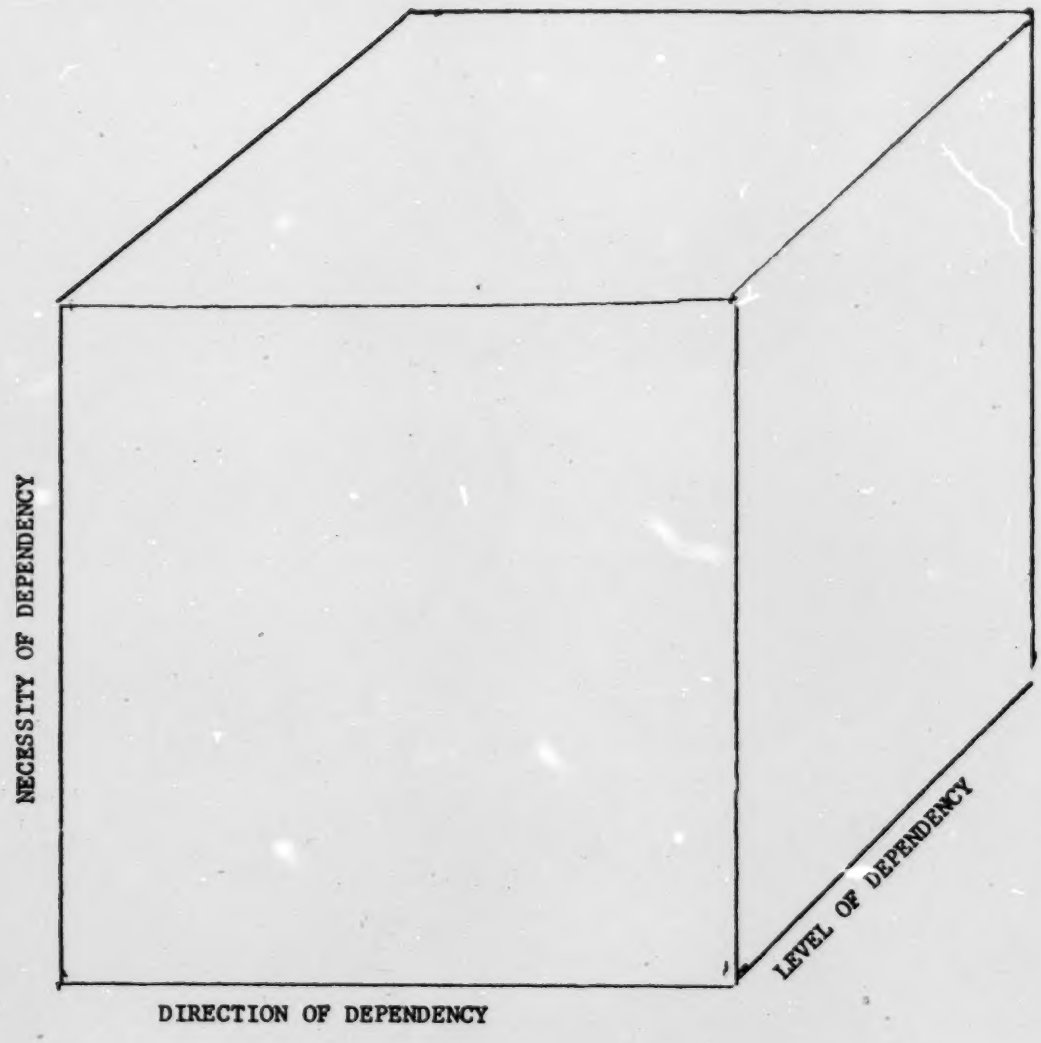

FIGURE I. THREE-DIMENSIONAL REPRESENTATION OF MAJOR ISSUES ALONG WHICH THEORIES DIFFER

By grouping theories according to their position on certain prominent issues, by pointing out the common differences between theories, it may be possible to provide a general framework for understanding and comparing such theories. An attempt is made to provide a framework broad enough to encompass not only those theories which have been set forth, but those which conceivably could be presented.

A Model for Examining the Issues:

A. The basic dimensions--A basic issue on which theories of language and thinking differ is the direction of dependency. One may assume that language provides the foundation for thinking (Whorf, 1940), or that logical development provides the foundation for language (Piaget, 1970[a]), or that the direction of dependency may be reciprocal--a linguistic concept based on logical concepts may in turn aid the fuller development of those and other logical concepts (Piaget, 1972). Positions on this issue may be conceptualized as having various values along a dimension, with a wide range of intermediate positions possible. A lucid discussion of this issue is offered by Jenkins (1969).

language fundamental ——— reciprocal ——— logic fundamental

DIRECTION OF DEPENDENCY

A second major issue is the necessity of the relationship specified in the first dimension. One may view the dependence of language on logical concepts (or the dependence of logical structures upon linguistic concepts) as essential for the development of parallel concepts in the other domain, as simply facilitative, or as inessential (although the concepts ordinarily develop in a predictable sequence).[3] These choice

points are conceptualized as points along a continuum, with many intermediate points also implied.

essential ——— facilitative ——— inessential

NECESSITY OF DEPENDENCY

The discussion by Flavell (1970) of the types of relationship possible between pairs of logical concepts appears also applicable to the issue of the necessity of the relationship of sets of linguistic and logical concepts.

A third major issue inplicit in discussion of the type of relationship between language and thinking is the level at which such dependency exists. The dependency may be viewed as system-wide, as applicable to clusters of concepts, or as operative at the level of specific concepts. System-wide dependency would imply that a certain level of development in one system as a whole would be required before certain development of the other system could proceed. One might, for example, stipulate that sensori-motor intelligence must be well developed before syntactic

system-wide ——— cluster ——— specific

LEVEL OF DEPENDENCY

development can begin (e.g., Sinclair-de-Zwart 1973). Alternatively, one might posit that a cluster of logical concepts, such as a set of temporal concepts, must be present before the related group of linguistic forms can develop (Slobin, 1970), or stipulate that a specific logical concept must develop before development of a specific linguistic concept can

occur. Beilin and Spontak (1969), for example, consider the relationship of logical reversibility and passive voice sentences and Koff and Luria (1973) have examined comparative concepts in linguistic and non-linguistic context.

In addition, it is likely that developmental psychologists will implicitly view the three-dimensional representation of relationships as moving through a fourth dimension, time. The issue related to this dimension is the stability of the relationships specified along the other dimensions over time.

The dimensions of direction of dependency and stability over time can be conceptualized as fully crossed. If one's position on direction of dependency specified a fixed direction of dependency, such as logic fundamental to language, it would be possible to see the degree or strength of the relationship as either varying or stable over time; if one postulated a reciprocal relationship, both degree and direction might be seen as varying over time.

Not only could the Direction of dependency vary over time (Jenkins, 1969), but the Level of dependency and Necessity of dependency and their various combinations could also be viewed as varying or stable over time or developmental status (Reese and Overton, 1970; Buss, 1974[b]). For example, Level of dependency could be seen as varying or stable over time even when direction and necessity were held constant. A theoretical position could be taken that the child moves from general dependence of one domain upon the other to dependence on a specific concept level and perhaps back to a general level of dependence. Necessity of dependence

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could be seen as either stable or varying over time, with a necessarily dependent relationship at one developmental stage changing to a facilitative relationship at another point in time.

Positions taken on these issues, conceptualized as values along dimensions, provide a useful capsule summary of major features of various theories of the relationship of children's language and thinking. Additional descriptive adequacy may be obtained by combining with position in this dimensionality a theory's position on certain corollary issues.

B. Corollary issues --- These corollary issues are in themselves major issues, but are less centrally concerned with the nature of the relationship of language and thinking than those previously discussed. They pertain rather to characteristics of each of the domains separately, and are primarily philosophical or epistemological concerns. Although these issues may also be described as dimensions, they are not so readily conceptualized as orthogonal to other dimensions. A theory may adopt one position on each of these dimensions in regard to language and quite another in regard to logical concepts.

The first of these corollary issues concerns the nature of knowledge, the degree to which man can directly apprehend objective reality.[4] The second issue concerns the manner in which knowledge is attained, the relative roles of experience and innate factors.[5] A third issue which has received considerable attention is the form in which knowledge is held. One aspect of this issue is often discussed in terms of the relationship of competence and performance.[6]

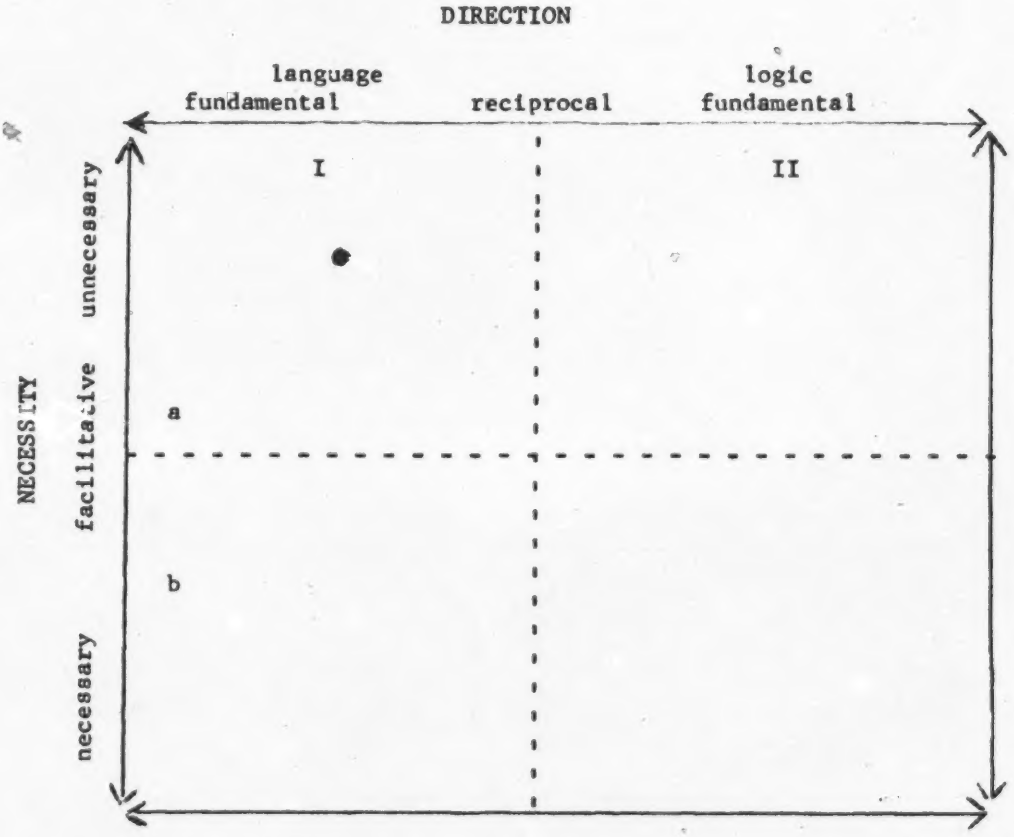
Another aspect of the form of knowledge is reflected in the relative tendency to view learning as the accumulation of associations

or as a restructuring of concepts. Such assumptions influence the type of evidence seen as sufficient to demonstrate knowledge and the method used to elicit such evidence (Overton and Reese, 1973; Wozniak, 1974; Wohlwill, 1970), but this topic is peripheral to the central theme of this paper.[7] These complex issues obviously deserve deeper exploration and have received considerable attention from many writers. Since, however, they are primarily concerned with the relationship of language and thinking, their existence is simply acknowledged before returning to the central theme of this discussion.

A scheme has been proposed for examing a variety of theories, the relationship of children's language and thinking in terms of three basic dimensions --- direction of dependency, necessity of dependency, and level of dependency. In order to illustrate and to test the usefulness of the proposed scheme, consider the possible combinations of these dimensions.

C. Combinations of the dimensions --- Although the issues on which various theoretical positions differ are described as dimensions or continua, discussion in this section will consider the possible combinations of the polar positions on these dimensions. This artificial dichotomy is employed only to simplify discussion, while providing a rigorous test of the applicability of the proposed model. Figure 2 represents one of the faces of the cube which forms within the three basic dimensions. It would be possible for a theory of the relationship of language and thinking to postulate that (Ia) language generally provides the foundation for logic, although it is not necessary that this kind of relationship occur; (Ib) language is fundamental to logic, and the direction of this relationship is essential; (IIa) logic usually

FIGURE 2


DIRECTION
language
fundamental
reciprocal
logic
fundamental
I
II
NECESSITY
unnecessary
facilitative
necessary
a
b

provides the basis for language development, although this relationship is not essential, and (IIb) logic is fundamental to language and this relationship is essential.

The reader may trace for himself all of the combinations which could be formed by taking the three dimensions two at a time, focusing on the various faces of the cube, and considering, not whether these positions are empirically well-founded, but whether such positions could be presented. The purpose of this discussion is not to articulate the author's position or to decide which theoretical position is most adequate, but to describe as coherently as possible the positions which have been or could be taken.

The three dimensions may be considered together to describe the position of a given theoretical model on these basic issues. Again dichotomizing dimensions in the interest of simplicity, as listed in Table I, theories which view language as the foundation for logic might appear in these forms: (IA1) language is fundamental to logic, in an essential relationship applicable on a system-wide level; (IA2) language is fundamental to logic, in an essential relationship applicable to specific concepts; (IB1) language is usually, though not necessarily, prior to logic on a system-wide level; and (IB2) language is usually though not necessarily, prior to logic on the level of specific concepts.

For theories which view logic as the foundation for language, parallel positions are possible; (IIA1), for example, would describe the position that logic is fundamental to language, in a necessary relationship applicable on a system-wide level. Again, the reader is invited to test the remaining combinatorial possibilities and to judge whether there are major theoretical positions which cannot be categorized

TABLE I

Possible Combinations In Terms of Basic Dimensions

I. LANGUAGE FUNDAMENTAL				II. LOGIC FUNDAMENTAL			
A. Necessary		B. Unnecessary		A. Necessary		B. Unnecessary	
1. system-wide	2. specific	1. system-wide	2. specific	1. system-wide	2. specific	1. system-wide	2. specific

00013

in terms of joint occurrence of the full range of the three dimensions described. (There is, of course, nothing sacred about these dimensions; they will have served a purpose if they provoke another to revise and clarify the points raised here.)

While only the polar positions were combined in forming the categories above, the same principles apply to combination of the intermediate positions. It would thus be possible, for example, to locate within this framework a theory which views clusters of language concepts as generally facilitative for clusters of linguistic concepts.

Applications:

A. Comparison of two theorists --- This framework would seem useful as a guide in comparing two theoretical positions, though finer scaling and additional criteria might be added for certain comparisons. One might, for example, compare Bruner (1964) and Piaget (1970[a]) in terms of their positions on the direction and necessity of dependence seen between language and thought, and whether they consider the relationship to remain constant or to change over the span of development.

B. Comparison of one theorist at two points in time --- Another application would be in the study of the evolution of a theoretical position, the changes over time in a given theorist's stated position. A statement made at one time may be modified later, in recognition of clarifications needed in an earlier statement, or of compelling new data, or the maturation of a conceptualization. These changes are not always made explicit, and the model presented might serve a tool for analysis. One might, for example, analyze changes in Lenneberg's (1964; 1967) position on the part that intelligence plays in language acquisition, or consider whether differences in Furth's (1964; 1966; 1971) statements

regarding the relative independence of formal operations and language represent clarifications or substantial changes. Similarly, one might examine whether McNeill's various statements (1966; 1967; 1970) on the relationship or lack of relationship between language and thinking are best described as refinements moving in a consistent direction or as abrupt changes in direction.

C. Implications of the model for designing tests of theoretical statements --- A third area of application is in determining the level of proof adequate for testing a given theoretical statement. Two positions may be generally similar and yet the one which is more specific may require more rigorous proof. Table II presents a series of statements about the relationship of two variables. To illustrate the way in which positions within the model are related to choice of appropriate empirical tests, let us stipulate that A represents some aspect of cognitive development, and B represents an aspect of language development.[8]

Statements 1 and 2 are fundamental but relatively unspecific. For statement 1, <u>any</u> indication of conceptual relatedness, including but not requiring evidence of structural similarity, would serve as support. Statistical tests and specified order of acquisition are not required. To support statement 2, there must be sufficient variance in both variables across a specified time period to allow adequate test of their covariance.

While evidence supporting statement 1 would provide partial support for the latter, more restrictive statements, failure to support the more restrictive statements could not be used to negate less restrictive statements. It is perhaps clearest to illustrate this by referring to

TABLE II

Statement	Evidence Required
1. Variables A and B are related	Conceptually related - similar in content, form or developmental patterns.
2. A and B are related during a given time period.	Significant correlation for a group or parallel development presumably reflecting expression of common basic function.
3. A usually occurs before B	Temporal ordering for groups but not necessarily for all individuals within group.
4. B in nature never occurs without A first occurring.	With wide sampling, the temporal order of A and B is consistent for all individuals.
5. Although B never occurs first under normal conditions, B can be induced to occur before A.	The usual order of A and B can be reversed under laboratory conditions.
6. B can under some circumstances be induced without prior occurrence of A, but responses differ qualitatively from spontaneously acquired concept of B.	Although the usual order can be reversed, induced concept leads to response, transfer, or generalizability different from that of spontaneously acquired concept.
7. B never occurs and <u>cannot</u> occur without A first.	Under no treatment that has been devised is B ever observed to occur prior to A.

two variables from within the same domain. If one chose to apply statement 2, for example, to the relationship of number conservation and volume conservation, the fact that number conservation is ordinarily mastered well before the understanding of volume conservation emerges makes it likely that low correlations would be found. This failure to support statement 2 would be unlikely to persuade one that there was not at least a conceptual similarity between the two variables.

Before discussing appropriate tests for statements 3 - 7 (a list which could, of course, be extended by finer-grained analysis or by combining these positions with additional stipulations), it may be useful to compare, in terms of the proposed model, the relative locations of the theoretical positions from which they are most likely to emanate.

In terms of the model, statement 7 seems to imply a position which views a specific cognitive concept as an essential precursor for a specific language concept. Consistency of the direction of dependency over time is not specified; the statement would, however, be compatible with a position of consistent dependence of specific linguistic concepts upon specific cognitive concepts.

The position implied in statement 3, on the other hand, differs from statement 7 on several dimensions. It would probably be closer to the facilitative position, less extreme on necessity of dependency, and might be closer to a system-wide level of dependence.

These differences directly affect the types of proof needed to confirm or reject the theory. Evidence which would be utterly damning for one position may be irrelevant or even supportive for a less restrictive though conceptually related position. While all of these statements may reflect a generally similar orientation on issues, Table I indicates

that for relatively restrictive formulations, there is increasing necessity to provide evidence that a pattern holds for individuals as well as for groups, that the pattern cannot be changed without qualitative differences in the concepts attained, or that the stipulated relationship is irreversible. Buss's (1974a) interesting exposition of a general developmental model yields data-gathering strategies helpful in examining such issues.

Limitations:

The model developed in this paper appears to have utility as an initial organizing scheme. It is nonetheless desirable to consider whether certain prominent issues not previously discussed can be adequately encompassed within this framework.

One matter that has received little attention in this paper is the multi-faceted nature of language and cognition. It would thus be possible for a theory to suggest that syntax and vocabulary, for example, have quite different kinds of relationships with a given aspect of cognition (Furth, 1971; Sinclair-de-Zwart, 1969). Various aspects of cognition, such as conservation of physical dimensions, skill in symbolic logic tasks, and social perceptions may be found to be related in different ways to a given aspect of language. Much current interest also centers on relationships within a domain, notably in the discussion of the relationships between syntax and semantics (Bloom, 1970; Brown, 1973; Olson, 1970[b]). Although this is not attempted in this paper, it seems likely that the model proposed could be employed to clarify the issues involved by guiding statements of relationships within a domain.

The possibility of cross-cultural differences has not been considered

here. A growing body of evidence (Cole et al. 1971) suggests that there are some aspects of cognitive development which transcend cultural boundaries and other aspects which are highly sensitive to cultural influence. Although the presence of certain linguistic universals is well established (Greenberg, 1966), it is also apparent that after the initial stages, there is increasing cultural diversity in linguistic forms employed. It is quite possible that the relationship of language and thinking varies across cultures. The proposed model could be adapted to examination of such issues by substituting for the fourth dimension of stability over time the dimension of stability over cultures.

The model proposed for examining theoretical positions on issues pertaining to the relationship of language and thinking seems to have sufficient power for initial organization and categorization, but it is possible that it lacks precision for finer analysis. The model may require fuller articulation or additional specification in order to deal with relationships such as "necessary but not sufficient" or with hierarchical relationships.

Conclusion:

A system for describing and categorizing various theories of language and thinking has been presented. Within this system, theories are described in terms of their position on three basic issues--the direction of dependency, the necessity of that direction of dependency, and the level of specificity at which the dependency is believed to operate. In addition, a theory may stipulate that these relationships are stable or varying over time.

Position on these dimensions, along with corollary assumptions

concerning the nature of language and thinking, provides a useful brief index which can facilitate comparison of theoretical positions. A clear, simple descriptive system which is adequate for initial categorization could potentially aid in clarification of theoretical conceptualizations and in the design of appropriate empirical tests.

The present formulation appears to meet the criteria of simplicity, relevance, and wide applicability. There is, however, no assertion that this is the only possible system, or that it is detailed enough for fine analysis. We invite our colleagues to apply this system to their own concerns and to share with us their comments.

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FOOTNOTES

[1]This position is most forcefully stated in Watson's (1924) pronouncement that thought is simply subvocal speech. A very different version of this position of sameness is compatible with structuralism--(Piaget, 1970[b]) it is possible to acknowledge differences in the content of linguistic and logical concepts and yet to search for similarities in the forms of knowledge, the rules of behavior, or developmental patterns.

[2]Piaget (1972[b]), for example, states that the operative aspects of intelligence develop initially during the sensori-motor period without aid from the figurative aspects, which include language, although completion of operational thinking requires language. The figurative aspects which develop during the early preoperational period at first compete with and are later subordinated to the operative (transformational) aspects, facilitating concrete operational thinking and permitting certain aspects of formal operations.

Although Chomsky (1968) states that understanding man's linguistic competence is a means of understanding general cognitive competence, he has suggested that linguistic competence is initially quite independent of cognitive development. The abstract linguistic competence attributed to the child is seen as unattainable through means of learning available to the child, thus requiring genetic preprogramming (Chomsky, 1965). While neither of these theorists rules out the possibility of a relationship language and thinking at some point in development, such a position could be advanced.

[3]Prominent among the researchers concerned with this issue is Furth (1971), who has undertaken intensive analysis of the role that

language deprivation in deaf and hard-of-hearing subjects plays in the late concrete operations and early formal operations periods. He concludes that language skill is not essential for the initial formation of certain formal operations, although it is apparently facilitative and may be required for their fullest development. Olson (1970[a], p. 184) finds that "language appears essential for some aspects of thought but not for others."

Bruner (1964) stressed the part that verbal responses play in the attainment of conservation, but Sinclair-de-Zwart found that while conservers displayed more mature language structures, training non-conservers on these same structures produced little improvement in conservation, leading to the conclusion that full understanding of these language structures requires prior formation of the logical structures (Inhelder and Sinclair, 1969).

Peisach's (1973) study of the relationship of dimensional language and conservation attempts to clarify such an issue. She finds no simple path of implication, and suggests that comprehension of dimensional terms leads to multiplication of classes, which, when coupled with reversibility, leads to conservation. Peisach thus concludes that comprehension of dimensional language is a necessary but not sufficient condition for development of conservation.

[4]One may assume that there is somewhere an objective reality which is more or less perfectly apprehended through the senses, a Realist position. Alternatively, one may assume that man cannot directly know reality, but actively and continually constructs representations of the world (von Glasersfeld, 1974), a Constructivist position.

[5]One may adopt an empiricist position, which heavily stresses the role of experience, an interactionist position or a nativist position, which posits an unfolding of generically specified knowledge. Anastasi's (1958) discussion of these positions in reference to intelligence may well be extended to either language or logical development.

[6]A theoretical position may assume that cognitive or linguistic competence is fully formed before birth, and that only performance develops gradually (Chomsky, 1965; McNeill, 1966). Competence and performance would thus be viewed as sharply different aspects of knowing, with competence, unlike performance, seen as an abstract representation that is invulnerable to temporary or long-standing environmental effects or to other aspects of the child's development. A more moderate position would suggest that while competence and performance differ, they are closely related---competence generally precedes performance although Blank (1974) notes some exceptions. A third position on this issue would state that competence and performance are all but indistinguishable --- competence is only another criterion for performance, one in which limiting performance factors are carefully minimized. Fuller discussion of these issues is offered by Watts (1970) and by Bever (1970).

The issues presented by Brainerd (1970) in reference to appropriate means of assessing cognitive development and by Hutson (in press) on assessing language development could well be extended to the relationship of language and cognition. Flavell and Hill's (1969) description of the attainment of concrete operations as a zone, a span from first-

in-competence to fully-in-performance, could serve as a starting point. Knowledge of a bread linguistic or logical concept would be seen as proceeding from the point where it was available under only a limited variety of circumstances and undemanding criteria to a point where it was available in a wide variety of circumstances even with employment of rigorous criteria. Analogously, the relationship of certain language and cognitive concepts might be viewed as changing over time and being reflected in progress through a graded series of criteria, a sliding scale of relative maturity of a relationship.

In both cases, while a given criterion may evaluate either the presence/absence or the probability of a concept or relationship under certain circumstances, progress through a set of criteria may be used to evaluate the strength of a concept or relationship. For example, the work of Flavell (1970[b]) suggests that children's performance on a task in which verbal labels can be helpful goes through several phases: (a) initially the child lacks the labels; (b) even when he comprehends and can produce the labels, the child may not use them to mediate the learning task; (c) the child may use the verbal mediators during the task when trained and required to do so; (d) he spontaneously uses the mediators in the task.

[8]Although reading Flavell and Wohlwill's (1969) thoughtful discussion of implicative and nonimplicative relationships has surely influenced my thinking on this topic, this discussion represents an integration of several sources rather than an application of any one source, and is intended only to suggest relevance of the model for design of empirical tests of the adequacy of various theoretical statements.

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